Calculation Cover Sheet

PB Power *303 Second Street, Suite 700 North*
San Francisco, CA 94107
415-281-8700
Fax: 415-281-8707

project:	Cosumnes Power Plant	***job no.:***	13578	***discipline:***	Civil
subject:	Detention Basin Routing Analysis			***calculation no.:***	13578-C-1
originator:	L. Gasparetti	***date:***	1/11/02	***file no.:***	
checker:		***date:***		***Sheet*** 1 ***of*** 7 ***Sheets***	

Purpose of Calculation

Provide reservoir routing analysis for detention basin.

Summary of Results and Conclusions Starts in Sheet No. _

Sources of Design Criteria

Sources of Formula and References:

FR-1 Rainfall Depth Duration Frequency for Eagles Nest (Department of Water Resources)

FR-2 Calculation No, 13561-C-1

Record of Issues

No.	Description	By	Date	Checked	Date	Approved	Date	Date Filmed

Preliminary Calculation	**X**	**Committed Preliminary Design Calculation**	
Superseded Calculation		**Final Calculation**	

project:	*SMUD*-Cosumnes Power Plant	***job no.:***	13578	***discipline:***	Civil
subject:	Detention Basin Routing Analysis			***calculation no.:***	13578-C-1
originator:	L. Gasparetti	***date:***	1/11/02	***file no.:***	
checker:		***date:***		***Sheet*** 2 ***of*** 7 ***Sheets***	

A. PURPOSE
See cover sheet.

B. METHODOLOGY
1. Define maximum inflow hydrograph and find maximum difference between areas under trapezoidal inflow hydrograph and desired basin discharge rate.

2. The Rational Method determines the peak runoff:

Q = CiA, where

Q = peak runoff (cfs)

C = runoff coefficient

i = rainfall intensity (in/hr) (based on time of concentration, T_c)

A = contributing area (acres)

C. DESIGN CRITERIA
1. Use 10-year frequency.
2. Use "C" for developed site from FR-2: C = 0.70
3. Use "A" for developed site from FR-2: A_{DEV} = 25.2 ac
4. Determine "i" from FR-1: i = max rainfall (in)/T_c(hr)

D. ASSUMPTIONS
1. For the purpose of this preliminary calculation, assume that the intial T_{c0} = 10. Therefore, the runoff from all tributary areas should peak at 10 minutes, which is often considered the shortest practical T_{c0} that produces the highest average intensity.

E. INFLOW HYDROGRAPH

T_c (min)	i (in/hr)	C x A	Q (cfs)
10	1.74	17.64	30.69
15	1.36	17.64	23.99
30	1.02	17.64	17.99
40	0.87	17.64	15.34
50	0.82	17.64	14.46
60	0.76	17.64	13.41
2 hr	0.53	17.64	9.35
3 hr	0.45	17.64	7.94
6 hr	0.29	17.64	5.12
12 hr	0.20	17.64	3.47
24 hr	0.11	17.64	1.94

F. OUTFLOW HYDROGRAPH
Outflow is restricted to the amount of runoff from the undeveloped site: Q_{UDEV} = 0.83 cfs

A00 H Eagles Nest SC

Rainfall Depth Duration Frequency for Eagles Nest

DWR # A00 2160 34 — Sacramento County — Latitude 38.485°
Analysis By DWR DLA — Longitude -121.260°
Data From : DWR, Sac Co Sta # 269 — TB 340:B-3 — Elevation 100 Feet

Maximum Rainfall For Indicated Number Of Concecutive Days

	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	1 Day	2 Day	3 Day	F Yr
1976			0.20	0.34	0.44	0.58	0.83	0.95	0.98	0.98			6.08
1977			0.15	0.24	0.30	0.36	0.39	0.55	0.71	0.82			5.89
1978					0.52	0.97	1.04	1.19	1.32	1.87			21.71
1979			0.13	0.17	0.27	0.43	0.58	0.88	1.03	1.20			15.72
1980			0.40	0.60	0.80	1.13	1.23	1.38	1.51	1.54			21.86
1981	0.05	0.09	0.14	0.18	0.29	0.47	0.61	0.93	1.25	1.64			12.43
1982			0.10	0.15	0.30	0.38	0.51	0.84	1.00	1.47			28.04
1983	0.15	0.20	0.20	0.35	0.65	0.90	1.10	1.40	1.78	2.73			35.89
1984	0.10	0.20	0.30	0.45	0.70	1.04	1.25	1.39	1.95	2.63			19.04
1985	0.06	0.12	0.18	0.36	0.56	0.74	0.91	1.01	1.31	1.32			10.99
1986	0.12	0.20	0.24	0.35	0.51	0.79	1.02	1.61	1.97	2.20	4.02	5.16	16.97
1987	0.04	0.08	0.12	0.24	0.28	0.39	0.47	0.71	1.18	1.73	1.77	2.01	12.01
1988	0.04	0.12	0.16	0.31	0.47	0.55	0.83	1.14	1.85	2.28	2.40	2.40	13.23
1989	0.08	0.16	0.16	0.24	0.39	0.47	0.59	0.79	1.02	1.14	1.50	1.73	14.69
1990	0.16	0.20	0.24	0.31	0.47	0.71	0.87	1.06	1.30	1.30	1.57	1.65	15.00
1991	0.20	0.24	0.24	0.24	0.43	0.63	0.91	1.30	1.57	1.57	1.85	2.68	14.91
1992	0.12	0.20	0.24	0.35	0.59	0.87	1.06	1.46	1.61	1.69	2.32	2.99	15.36
1993	0.16	0.20	0.28	0.28	0.47	0.51	0.63	0.79	1.38	1.81	2.28	0.20	16.45
1994	0.16	0.20	0.24	0.35	0.47	0.59	0.91	1.14	1.18	1.18	1.42	2.42	10.04
1995	0.28	0.47	0.59	0.87	1.02	1.26	1.65	1.97	2.24	2.60	3.03	3.58	26.06
1996	0.16	0.28	0.35	0.63	0.75	1.06	1.14	1.38	5.10	1.97	3.03	3.31	20.86
1997	0.24	0.31	0.31	0.51	0.91	1.18	1.42	1.57	1.85	2.44	2.87	3.31	21.50
1998	0.12	0.16	0.16	0.31	0.43	0.71	0.94	1.46	2.13	2.87	3.50	3.82	31.11
1999	0.08	0.12	0.16	0.20	0.43	0.75	0.98	1.22	1.22	1.38	1.54	2.52	15.36
2000													
Average	.13	.20	.23	.35	.52	.73	.91	1.17	1.60	1.77	2.36	2.70	17.55
Stdev	.07	.09	.11	.17	.20	.27	.31	.34	.85	.59	.82	1.17	7.36
Rec Max	.28	.47	.59	.87	1.02	1.26	1.65	1.97	5.10	2.87	4.02	5.16	35.89
Rec Min	.04	.08	.10	.15	.27	.36	.39	.55	.71	.82	1.42	.20	5.89
Z	3.33	3.93	4.45	4.24	2.75	2.08	2.30	1.94	6.21	1.78	.52	.39	3.37
Yrs Rec	18	18	23	23	24	24	24	24	24	24	14	14	24
CV	.523	.463	.477	.484	.385	.373	.339	.287	.529	.332	.347	.435	.419
Reg CV	.352	.352	.352	.352	.352	.352	.352	.352	.352	.352	1.352	2.352	.310
alc Skew	.6	1.6	1.8	1.6	1.0	.4	.4	.3	3.2	.4	.6	.0	.8
Reg Skew	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.4
FIC	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
RP 2	.12	.18	.22	.33	.49	.68	.85	1.10	1.50	1.65	1.79	1.56	17.19
RP 5	.16	.25	.29	.44	.65	.92	1.15	1.48	2.02	2.23	4.75	7.43	21.99
RP 10	.19	.29	.34	.51	.76	1.07	1.34	1.72	2.36	2.60	6.65	11.21	24.72
RP 25	.22	.34	.40	.60	.90	1.26	1.57	2.02	2.77	3.05	8.97	15.81	27.78
RP 50	.25	.38	.44	.67	.99	1.39	1.74	2.24	3.06	3.37	10.63	19.11	29.85
RP 100	.27	.41	.48	.73	1.08	1.52	1.90	2.44	3.34	3.68	12.23	22.29	31.78
RP 200	.29	.45	.52	.79	1.17	1.64	2.06	2.65	3.62	3.99	13.79	25.39	33.59
RP 500	.32	.49	.57	.87	1.29	1.81	2.26	2.91	3.98	4.38	15.84	29.46	36.00
RP 1000	.34	.52	.61	.92	1.37	1.93	2.41	3.10	4.24	4.67	17.30	32.36	37.49
RP 10000	.41	.63	.73	1.11	1.65	2.31	2.90	3.72	5.09	5.61	22.13	41.96	42.56

JDG

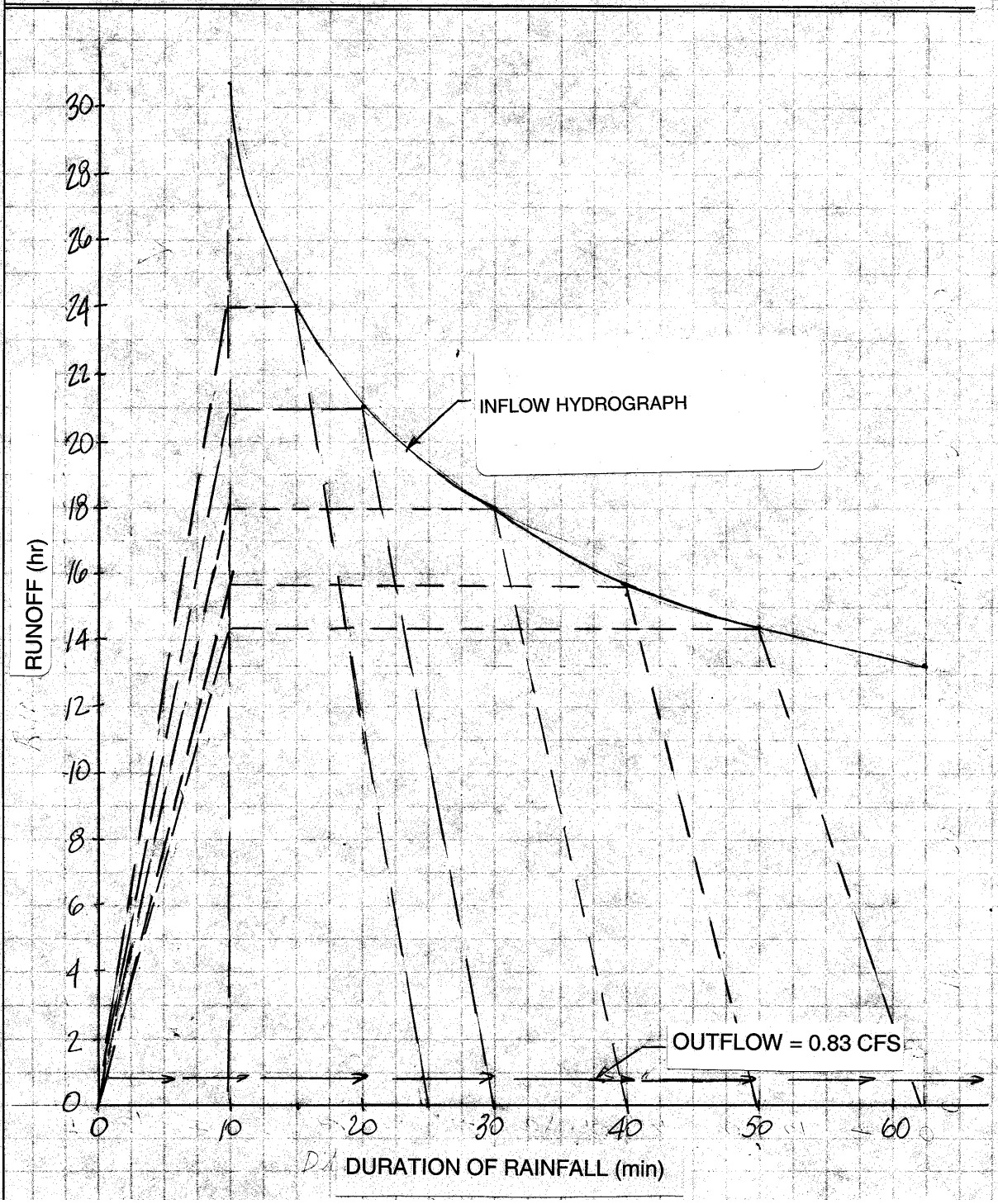
$i = \frac{\text{max rainfall}}{hr}$

6/1/01

PARSONS BRINCKERHOFF
COMPUTATION SHEET

Subject: **SMUD – Consumnes Power Plant**
Detention Basin Routing Analysis

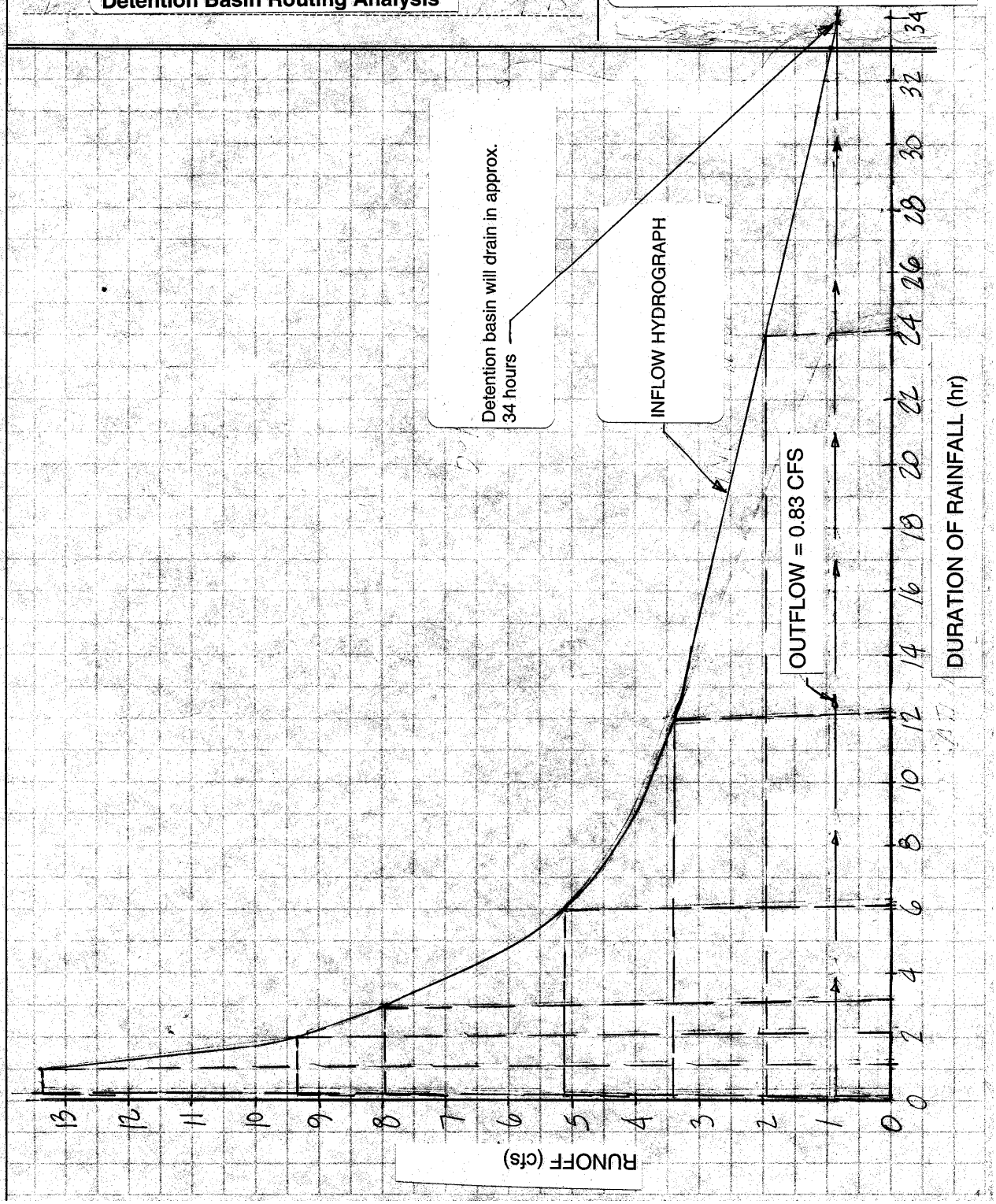
Sheet **4** *of* **7**
Calc. No. **13578-C-1**
Originator **L. Gasparetti**
Date **1/11/02**
Checked by
Date



PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject **SMUD – Consumnes Power Plant Detention Basin Routing Analysis**

Sheet **5** *of* **7**
Calc. No. **13578-C-1**
Originator **L. Gasparetti**
Date **1/11/02**
Checked by
Date



G. STORAGE VOLUMES

$V_{TC} = A_{TRAPEZOID}(60 \text{ sec/min})(Q_{in} - Q_{out})$
$V_{15} = ((5+24)/2)(60)(24 - 0.83) = 20{,}200 \text{ ft}^3$
$V_{30} = ((20+39)/2)(60)(18 - 0.83) = 31{,}700 \text{ ft}^3$
$V_{60} = ((50+63)/2)(60)(13.41 - 0.83) = 42{,}600 \text{ ft}^3$
$V_{3hr} = ((170+183)/2)(60)(7.94 - 0.83) = 75{,}300 \text{ ft}^3$
$V_{6hr} = ((350+363)/2)(60)(5.12 - 0.83) = 91{,}500 \text{ ft}^3$
$V_{12hr} = ((710+720)/2)(60)(3.47 - 0.83) = 113{,}300 \text{ ft}^3$
$V_{24hr} = ((1430+1440)/2)(60)(1.94 - 0.83) = 95{,}600 \text{ ft}^3$

PARSONS BRINCKERHOFF COMPUTATION SHEET

Calc. No. **13578-C-1**
Originator **L. Gasparetti**
Date **1/11/02**
Checked by
Date

Subject **SMUD – Consumnes Power Plant Detention Basin Routing Analysis**